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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of: Amin et al. Confirmation No.: 3336
Serial No.: 10/719,925 Art Unit: 2811
Filed: November 20, 2003 Examiner: Sara W. Crane
For: QUANTUM LOGIC USING Attorney Docket No.: 706700-999150
THREE ENERGY LEVELS

INFORMATION DISCLOSURE STATEMENT

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with the duty of disclosure provisions of 37 C.F.R. §1.56, there is hereby provided certain information which the Examiner may consider material to the examination of the subject U.S. patent application. It is requested that the Examiner make this information of record if it is deemed material to the examination of the application.

1. Enclosures accompanying this Information Disclosure Statement are:
 - 1a. ☒ A list of all patents, publications, applications, or other information submitted for consideration by the office.
 - 1b. A legible copy of :
 - ☒ Each publication or that portion which caused it to be listed on the PTO-1449;
 - ☒ For each cited pending U.S. application, the application specification including the claims, and any drawing of the application, or portion of the application which caused it to be listed on the PTO-1449 including any claims directed to that portion;
 - ☒ all other information or portion which caused it to be listed on the PTO-1449.
 - 1c. ☐ An English language copy of search report(s) from a counterpart foreign application or PCT International Search Report.
 - 1d. ☐ Explanations of relevancy (ATTACHMENT 1(d), hereto) or English language abstracts of the non-English language publications.
 - 1e. ☒ Pursuant to 37 C.F.R. § 1.98(a)(2)(ii), copies of the cited U.S. patents and U.S. patent application publications (*i.e.*, references AA to AH) are not submitted herewith.
2. ☒ This Information Disclosure Statement is filed under 37 C.F.R. §1.97(b):
 - ☐ Within three months of the filing date of a national application other than a continued prosecution application under §1.53(d);
 - ☐ Within three months of the date of entry of the national stage as set forth in §1.491 in an international application;

- ☒ Before the mailing of the first Office action on the merits;
- ☐ Before the mailing of a first Office action after the filing of a request for continued examination under §1.114.

3. ☐ This Information Disclosure Statement is filed under 37 C.F.R. §1.97(c) after the period specified in 37 C.F.R. §1.97(b), but before the mailing date of any of a final action under 37 C.F.R. §1.113, a notice of allowance under 37 C.F.R. §1.311 or an action that otherwise closes prosecution in the application.

(Check either Item 3a or 3b)

- 3a. ☐ The Certification Statement in Item 5 below is applicable. Accordingly, no fee is required.
- 3b. ☐ The \$180.00 fee set forth in 37 C.F.R. §1.17(p) in accordance with 37 C.F.R. §1.97(c) is:
- ☐ enclosed
- ☐ to be charged to Jones Day Deposit Account No. 50-3013.

(Item 3b to be checked if any reference known for more than 3 months)

4. ☐ This Information Disclosure Statement is filed under 37 C.F.R. §1.97(d) after the period specified in 37 C.F.R. §1.97(c), but on or before the date of payment of the issue fee.

The Certification Statement in Item 5 below is applicable.

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5. ☐ Certification Statement (applicable if Item 3a or Item 4 is checked)

(Check either Item 5a or 5b)

- 5a. ☐ In accordance with 37 C.F.R. §1.97(e)(1), it is certified that each item of information contained in this Information Disclosure Statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement.
- 5b. ☐ Each item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart application, and the communication was not **received** by any individual designated in 37 C.F.R. §1.56(c) more than thirty days prior to the filing of this information disclosure statement.
- 5c. ☐ Pursuant to 37 C.F.R. §1.704(d), each item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart application, and the communication was not **received** by any individual designated in 37 C.F.R. §1.56(c) more than thirty days prior to the filing of this information disclosure statement.

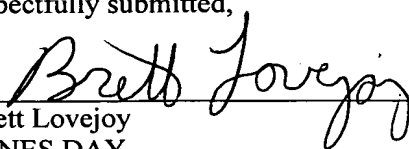
6. ☐ This application is a continuation application under 37 C.F.R. §1.53(b) or (d).

(Check appropriate Items 6a, 6b and/or 6c)

- 6a. ☐ A Petition to Withdraw from issue under 37 C.F.R. §1.313(b)(5) is concurrently filed herewith.
- 6b. ☐ Copies of publications listed on Form PTO-1449 from prior application Serial No. , filed on , of which this application claims priority under 35 U.S.C. §120, are not being submitted pursuant to 37 C.F.R. §1.98(d).
- 6c. ☐ Copies of the publications listed on Form PTO-1449 were not previously cited in prior application Serial No. , filed on , and are provided herewith.
7. ☐ This is a Supplemental Information Disclosure Statement. (Check Item 7a)
- 7a. ☐ This Supplemental Information Disclosure Statement under 37 C.F.R. §1.97(f) supplements the Information Disclosure Statement filed on . A bona fide attempt was made to comply with 37 C.F.R. §1.98, but inadvertent omissions were made. These omissions have been corrected herein. Accordingly, additional time is requested so that this Supplemental Information Disclosure Statement can be considered as if properly filed on .
8. ☐ In accordance with 37 C.F.R. §1.98, a concise explanation of what is presently understood to be the relevance of each non-English language publication is:
- (Check Item 8a, 8b, or 8c)
- 8a. ☐ satisfied because all non-English language publications were cited on the enclosed English language copy of the PCT International Search Report or the search report from a counterpart foreign application indicating the degree of relevance found by the foreign office.
- 8b. ☐ set forth in the application.
- 8c. ☐ enclosed as an attachment hereto.
9. ☒ The Commissioner is authorized to charge any additional fee required or credit any overpayment for this Information Disclosure Statement and/or Petition to Jones Day Deposit Account No. 50-3013.
10. ☒ No admission is made that the information cited in this Statement is, or is considered to be, material to patentability nor a representation that a search has been made (other than a search report of a foreign counterpart application or PCT International Search Report if submitted herewith). 37 C.F.R. §§1.97(g) and (h).

Respectfully submitted,

Date: February 15, 2005


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Substitute for form 1449A/PTO				Complete if Known		
LIST OF REFERENCES CITED BY APPLICANT (use as many sheets as necessary)				Application Number	10/719,925	
				Filing Date	11/20/2003	
				First Named Inventor	Mohammad H.S. Amin	
				Art Unit	2811	
				Examiner Name	Sara W. Crane	
Sheet	1	of	3	Attorney Docket Number	706700-999150	
U.S. PATENT DOCUMENTS						
Examiner Initials	Cite No. ¹	Document Number Number - Kind Code ² (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	
	AA	US- 5,323,344	06-21-1994	Katayama et al.		
	AB	US- 5,768,297	06-16-1998	Shor		
	AC	US- 6,459,097 B1	10-01-2002	Zagoskin		
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	AE	US- 6,563,311 B2	05-13-2003	Zagoskin		
	AF	US- 6,627,915 B1	09-30-2003	Ustinov et al.		
	AG	US-6,803,599 B2	10-12-2004	Amin et al.		
	AH	US- 2004/0077503 A1	04-22-2004	Blais et al.		
	AI	US- 60/341,974		Il'ichev et al.		
	AJ	US- 60/370,087		Lidar et al.		
	AK	US- 60/429,170		Amin et al.		
FOREIGN PATENT DOCUMENTS						
Examiner Initials	Cite No. ¹	Foreign Patent Document Country Code ³ - Number ⁴ - Kind Code ⁵ (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T ⁶
OTHER ART (Including Author, Title, Date, Pertinent Pages, Etc.)						
	AL	Amin, M.H.S., A.N. Omelyanchouk, A.M. Zagorskin, 2001, "Mechanisms of spontaneous current generation in an inhomogeneous <i>d</i> -wave superconductor," Phys. Rev. B 63 , 212502.				
	AM	Amin, M.H.S., A.N. Omelyanchouk, S.N. Rashkeev, M. Coury, A.M. Zagorskin, 2002, "Quasiclassical Theory of Spontaneous Currents at Surfaces and Interfaces of <i>d</i> -Wave Superconductors," Physica B 318 , 162.				
	AN	Averin, D.V., J.R. Friedman, J.E. Lukens, 2000, "Macroscopic resonant tunneling of magnetic flux," Phys. Rev. B 62 , 11802.				

Examiner Signature		Date Considered	
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				Art Unit	2811
				Examiner Name	Sara W. Crane
Sheet	2	of	3	Attorney Docket Number	706700-999150

AO	Blais, A., A. Maassen van den Brink, A.M. Zagorskin, 2003, "Tunable Coupling of Superconducting Qubits," Phys. Rev. Lett. 90 , 127901.
AP	Blais, A., A.M. Zagorskin, 2000, "Operation of universal gates in a solid-state quantum computer based on clean Josephson junctions between <i>d</i> -wave superconductors," Phys. Rev. A 61 , 042308.
AQ	Bruder, C., A. van Otterlo, G.T. Zimanyi, 1995, "Tunnel junctions of unconventional superconductors," Phys. Rev. B 51 , 12904.
AR	Cohen-Tannoudji, C.N., 1998, "Manipulating atoms with photons," Rev. Mod. Phys. 70 , p. 707-719.
AS	DiVincenzo, D.P., 2000, "The Physical Implementation of Quantum Computation", published on ArXiv.org preprint server: quant-ph/0002077.
AT	Dodd, J.L., M. A. Nielsen, M.J. Bremner, and R.T. Thew, 2002, "Universal quantum computation and simulation using any entangling Hamiltonian and local unitaries," Phys. Rev. A 65 , 040301.
AU	Došlić, N., O. Kühn, J. Manz, K. Sundermann, 1998, "The 'Hydrogen Subway' – A Tunneling Approach to Intramolecular Hydrogen Transfer Reactions Controlled by Ultrashort Laser Pulses," Jour. Phys. Chem. A 102 , 9645-9650.
AV	Ferguson, A.J., P.A. Cain, D.A. Williams, G.A.D. Briggs, 2002, "Ammonia-based quantum computer," Phys. Rev. A 65 , 034303.
AW	Feynman, R., 1965, <i>The Feynman Lectures on Physics Vol. 3</i> , Addison-Wesley, Reading, Mass., pp. 8.11-8.14.
AX	Friedman, J.R., D.V. Averin, 2002, "Aharonov-Casher-Effect Suppression of Macroscopic Tunneling of Magnetic Flux," Phys. Rev. Lett. 88 , 050403.
AY	Il'ichev, E., M. Grajcar, R. Hlubina, R. P. J. IJsselsteijn, H. E. Hoenig, H.-G. Meyer, A. Golubov, M. H. S. Amin, A. M. Zagorskin, A. N. Omelyanchouk, M.Yu. Kupriyanov, 2001, "Degenerate Ground State in a Mesoscopic YBa ₂ Cu ₃ O _{7-x} Grain Boundary Josephson Junction," Phys. Rev. Lett. 86 , 5369.
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BA	Kulik, I.O., T. Hakioglu, A. Barone, 2002, "Quantum Computational Gates with Radiation Free Couplings," arXiv.org:cond-mat/0203313.
BB	Lu, N., E.J. Robinson, P.R. Berman, 1987, "Coherent dynamics and complete population depletion of a special three-level quantum system," Phys. Rev. A 35 , 5088-5098.
BC	Maassen van den Brink, A., 2003, "Comment on 'Aharonov-Casher-Effect Suppression of Macroscopic Tunneling of Magnetic Flux'," arXiv.org:cond-mat/0206218.
BD	Makhlin Y., G. Schön, and A. Shnirman, 2001, "Quantum-State Engineering with Josephson-Junction Devices," Rev. of Mod. Phys. 73 , pp. 357-400.

Examiner Signature		Date Considered	
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				Art Unit	2811
				Examiner Name	Sara W. Crane
Sheet	3	of	3	Attorney Docket Number	706700-999150

	BE	Martinis, J.M., S. Nam, J. Aumentado, C. Urbina, 2002, "Rabi Oscillations in a Large Josephson-Junction Qubit," Phys. Rev. Lett. 89 , 117901.
	BF	Metcalf, J., P. van der Straten, 1999, <i>Laser Cooling and Trapping</i> , Springer-Verlag, New York, pp. 259-261.
	BG	Mooij, J.E., T.P. Orlando, L. Levitov, L. Tian, C.H. van de Wal, S. Lloyd, 1999, "Josephson Persistent-Current Qubit," Science 285 , 1036.
	BH	Murali, K.V.R.M., D.S. Crankshaw, T.P. Orlando, Z. Dutton, W.D. Oliver, 2003, "Probing Decoherence with Electromagnetically Induced Transparency in Superconductive Quantum Circuits," arXiv.org:cond-mat/0311471.
	BI	Nicoletti, S., H. Moriceau, J.C. Villegier, D. Chateigner, B. Bourdeaux, C. Cabanel, J.Y. Laval, 1996, "Bi-epitaxial YBCO grain boundary Josephson junctions on SrTiO ₃ and sapphire substrates," Physica C 269 , 255-267.
	BJ	Nielsen, M.A., and I.L. Chuang, 2000, <i>Quantum Computation and Quantum Information</i> , Cambridge University Press, Cambridge, UK, p. 174.
	BK	Orlando, T.P., J.E. Mooij, L. Tian, C.H. van der Wal, L.S. Levitov, S. Lloyd, J.J. Mazo, 1999, "Superconducting persistent-current qubit," Phys. Rev. B 60 , 15398.
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	BM	Plastina, F., G. Falci, 2002, "Communicating Josephson Qubits," arXiv.org:cond-mat/0206586.
	BN	Shore, B.W., 1990, <i>The Theory of Coherent Atomic Excitation Vol. 2</i> , Wiley, New York, section 13.7.
	BO	Tian, L., S. Lloyd, 2000, "Resonant cancellation of off-resonant effects in a multilevel qubit," Phys. Rev. A 62 , 050301.
	BP	Yu, Y., S. Han, X. Chu, S.-I Chu, Z. Wang, 2002, "Coherent Temporal Oscillations of Macroscopic Quantum States in a Josephson Junction," Science 296 , 889-892.
	BQ	Zagoskin, A.M., 1999, "A scalable, tunable qubit, based on a clean DND or grain boundary D-D junction," arXiv.org:cond-mat/9903170.
	BR	Zhou, Z.Y., S.-I Chu, S. Han, 2002, "Quantum computing with superconducting devices: A three-level SQUID qubit," Phys. Rev. B 66 , 054527.
Examiner Signature		Date Considered

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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